REMARKS

Claims 19-35 are now pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejection(s) in view of the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 19, 24-27 and 30 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Lamprecht (U.S. Pat. No. 5,875,018) in view of Maguire (U.S. Patent No. 7,439,940). Applicant respectfully traverses this rejection.

Historical development of the research on eye movements and some principles of eye movements can be understood by referring to the following documents:

[1] Wade, N. J.; Tatler, B. W., The moving Tablet of the Eye: The Origins of Modern Eye Movement Research, pp 6-7, Oxford, 2005;

[2] von Romberg G., Ohm J., Ergebnisse der Spiegelnystagmografie. Gräfes Arch. Ophtalm., Vol. 146, pp 388-402, 1944;

[3] Howard I., Evans J.,The measurement of eye torsion. Vision Res, Vol. 61, pp 447-455, 1963;

[4] Collewijn H, Steen J, Ferman L, Jansen T, Human ocular counterroll: assessment of static and dynamic properties from electromagnetic scleral coil recordings. Exp Brain Res, Vol. 59, pp185-196, 1985;

[5] Young L.R., et al., Ocular torsion on earth and in weightlessness. Ann N Y Acad Sci, Vol. 374, pp 80-92, 1981;

[6] Haslwanter T., Straumann D., Hess B.J., Henn V., Static roll and pitch in the monkey: shift and rotation of listing's plane. Vision Res., Vol. 32, pp 1341-1348, 1992.

[7] Duchowski A.T., Eye tracking methodology: theory and practice, London, 2003.

Please note that references [1] and [7] were published after the priority date of the present application. Reference [1] is only used for demonstrating the earliest developments. Reference [7] is used for demonstrating the present taxonomy.

In sum, eye movements have been measured for the first time with the method of afterimages by Wells in 1792 [1]. In 1853, this method was also used by Ruete for observing for the first time torsional eye movements [1]. In 1866, Helmholtz discovered most of the geometric implications of *Listing's law*, which states that the eye torsion depends on the horizontal and vertical eye position [6].

The first objective tracking method for eye torsion, the so-called mirror nystagmography, was used by von Romberg and Ohm in 1944 [2]. A comprehensive overview of the then state-of-the-art techniques for measuring eye torsion can be found in Howard and Evans [3]. In 1985, the search coil technique, the current standard in ocular motor research, was extended for the first time by Collewijn et al. to the measurement of torsion [4]. In 1983, Young and Lichtenberg developed the first video eye tracker that was able to calculate ocular torsion in real-time [5]. Thus, methods for detecting and tracking eye movements including torsion have been known for more than a century.

Eye movements are classified into voluntary and involuntary eye movements. Voluntary eye movements include fixations, smooth pursuits and saccades. These eye movements operate in *Listing's plane*, which means that the neural control signal is two-dimensional. According to *Listing's law*, these voluntary movements also include a torsion of the eye. It should be noted that gaze movements are not exclusively eye movements, but are composed of a coordinated eye and head movement. The involuntary or reflexive types of eye movements are the eye movements generated by

the vestibulo-ocular and the optokinetic reflexes. These involuntary movements can occur around three axes: horizontal, vertical and also torsional.

The vestibulo-ocular reflex also counter-rotates the eyes around the line of sight (torsion) if the head is rotated in the roll or torsional plane. This counter-rotation stabilizes the retinal image. This can easily be observed in an experiment in front of a mirror: If the head is sinusoidally rotated around the line of sight, from right-ear down to left-ear down, one can recognize in the mirror how the eyes counter-rotate in the head.

Lamprecht discloses a process and a device for cross-eyed persons, who suffer from a deviation of the angular position of the optical axis of one eye from the optical axis of the other eye. As noted by the Examiner, Lamprecht fails to disclose detecting rolling movements of at least one eye. Rather, the Examiner relies upon Maguire to teach this claimed feature. More specifically, the examiner refers to Maguire, column 27, lines 14 -16 and states that Maguire discloses eye position monitors which measure torsion of the eye of the user. The examiner further concludes that it would have been obvious to the skilled person to modify Lamprecht by specifically providing detecting rolling movements of at least one eye of the user, as taught by Maguire, for the purpose of accounting for the vestibulo-ocular reflex which occurs due to head rotation. Applicant respectfully submits that this conclusion is based on hindsight.

Maguire teaches the use of eye position monitors which measure torsion of the eye of the user in column 27, lines 14-16. But in the next sentence, namely, in column 27, lines 16-19, Maguire teaches also:

> "If torsions are not measured they can be computed or looked up, if desired, based on the point of convergence and torsions that can be predicted according to average human behavior, as stored in a look-up table."

Thus, Maguire considers two equivalent possibilities for determining the torsion of the eyes. One possibility is the detection of the actual torsion by position monitors; the other possibility is looking-up the torsion in a table based on the point of convergence. But looking-up the torsion in a table based on the point of convergence would not result in stabilizing the images taken by the cameras since a table listing the torsion as a function of the actual position of the point of convergence can only reflect the torsion according to *Listing's law* but not the additional torsion caused by the vestibulo-ocular reflex since a torsion caused by the vestibulo-ocular reflex does not depend on the actual position of the point of convergence but depends on the actual tilt of the head around the rolling axis and such a tilt is not measured by Maguire. The effect, that the additional torsion caused by the verstibulo-ocular reflex depends on the inclination of the head, has for instance been demonstrated by Haslwanter T., Straumann D., Hess B.J., Henn V. in "Static roll and pitch in the monkey: shift and rotation of listing's plane" Vision Res., Vol. 32, pp 1341-1348, 1992, where it has been shown that the additional torsion of the eyes depends on the tilt about the rolling axis of the head. Since Maguire is not measuring such a tilt, Maguire is not able to determine the actual torsion of the eyes by looking up a table. Albeit Maguire considers both possibilities as equivalent. Since Maguire considers both possibilities as equivalent, Maguire had certainly not thought of the concept of using the vestibule-ocular reflex for stabilizing the cameras.

Rather, Maguire teaches on column 4, lines 40 to 47:

> ... to mount the camera "on a two-degree of freedom platform for simulating two of the three degrees of freedom of the eye in its socket (omitting torsions) and mounting the platform on another platform having three rotational degrees of freedom, e.g. a cameraman's head".

In other words, Maguire proposes nothing more than Lamprecht, namely controlling the positioning of the cameras depending on the orientation of the visual axis, but not depending on the torsion of the eyes. Thus, Maguire does not contain any teaching, suggestion or motivation that would have caused the skilled person to modify the apparatus of Lamprecht into the claimed subject-matter. For at least this reason, it is respectfully submitted that the pending claims define patentable subject matter over this combination of references.

While assessing obviousness, it should be taken into account that the solution of the problem has not been found although the problem of stabilizing head-mounted cameras was known for a long time and although means for detecting and tracking the torsion of the eyes have also been known as set forth above.

With regard to claim 20, the examiner refers to Smyth that discloses an apparatus for measuring eye gaze. The examiner further refers to column 8, lines 58 to 67 where Smyth discloses classifying eye movements as fixations, saccadic movements or pursuit tracking. The examiner finally states that saccadic movements are involuntary movement and that Smyth consequently discloses the analysis of voluntary and involuntary movements as claimed in claim 20. As has been pointed out above, saccadic movements are voluntary movements. Thus, Smyth does not disclose an analysis unit analyzing voluntary and involuntary movements performed by the user. For this additional reason, it is respectfully submitted that claim 20 defines patentable subject matter over the combination of applied references.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested.

If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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